

POWER PROFILE

Customer: Oliveira Energia

Location:

Boa Vista, State of Roraima (Amazon Region), Brazil

Customer Business Issue:

Reliable source of power for a regional utility isolated from the Brazilian national grid

Solution:

34 Cat® C175-20 diesel generator sets

Cat® Dealer:

Sotreq



Founded as a mining town, Boa Vista is the largest city in the remote Brazilian state of Roraima.

POWER NEED

The capital of the state of Roraima, Boa Vista is the largest Brazilian city north of the equator. Situated on the western bank of the River Branco, this region of about 470,000 residents is separated from the rest of the country by the nearly impenetrable Amazon rainforest.

Isolated from the Brazilian national power grid – Sistema Interligado Nacional – the region has long been responsible for securing its own power, which for many years was supplied by local gas turbines as well as sources in Venezuela 135 miles away.

In 2009, the aging power generation equipment in Boa Vista began to fail, and the amount of power available from Venezuela was insufficient for meeting the region’s needs. Brownouts were common, power rationing was instituted, and an immediate solution was imperative.

The regional electrical utility, Eletrobras Distribuição Roraima, turned to Oliveira Energia, a supplier of power plants and emergency power installations that deliver over 330 MW of power to more than 50 municipalities throughout the Amazon region of Brazil. In eight short weeks, Oliveira Energia began supplying more than 40 MW of power from the UTE Floresta Plant, a temporary installation near an existing substation in Boa Vista that included 32 containerized Cat 3516A and 3516B diesel generator sets.

Regional power administrators intended to use these generator sets as a temporary, two-year fix until a connection with the Brazilian national power grid could be completed. But with this project facing a series of delays, Eletrobras Distribuição Roraima initiated planning for its own permanent power plant sized to meet current and future needs.

“Infrastructure projects in the Amazon rainforest, such as building power transmission lines, are very difficult and take a long time to complete,” said Jocely Ferreira Lima, manager of the operation, maintenance and generation department for Eletrobrás Distribuição Roraima. “Government authorities are very strict in granting permits for clearing the land, and once

projects are started, the wet climate and moist soil conditions present tremendous challenges for construction.”

To meet the near-term needs of the region, Eletrobras Distribuição Roraima issued a request for bids on the UTE Monte Cristo Thermal Power Plant, designed with a capacity of 107 MW to serve about 115,000 customers in Boa Vista and nine other municipalities in the state of Roraima.

“Given the unique issues we face in delivering power to the Amazon region, we outlined numerous technical requirements for this plant to meet,” Lima said. “We required generator sets offering low emissions, low noise pollution and excellent performance in controlling voltage and frequency.”

SOLUTION

Oliveira Energia has used Cat generator sets exclusively for the past seven years, buying more than 100 of them in 2014 alone.

“It’s important for us to select quality, reliable power solutions that will withstand the high-temperature, high-humidity conditions common in the Amazon region, which shorten the useful life of the equipment,” said Pedro Farias, technical director for Oliveira Energia. “Dependable equipment is a must, as it is difficult to ship parts to our customers. Many municipalities are reachable only by boat, with some two weeks away. By using equipment from Caterpillar, we have managed to maintain availability above 90 percent.”

Oliveira Energia teamed up with Caterpillar and the local Cat dealer, Sotreq, to develop a proposal for the Monte Cristo power plant, and the companies ultimately won in a blind bidding process, with the design, construction and commissioning mandated on an accelerated eight-month timeframe.

“A plant like this typically takes about three years for government agencies to construct, but we built this plant in record time, which doesn’t happen in Brazil,” said Mr. Orsine Oliveira, president and chief executive officer of Oliveira Energia.

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To meet the project requirements, Oliveira Energia, Caterpillar and Sotreq assembled a team that included Enerwatt, a provider of energy measurement, protection and remote monitoring systems.

Project designers elected to outfit the plant with 34 Cat C175-20 diesel generator sets, since transporting diesel fuel to the state of Roraima is much simpler and less expensive than natural gas, heavy oil or any other type of fuel. Supplying 3150 kW of gross power in continuous power applications, the Cat C175-20 generator set requires less maintenance and provides the highest power density of any single high-speed diesel generator set available on the market today. The smaller footprint meant fewer generator sets would be needed for the project, reducing construction costs.

Specifically engineered for the Monte Cristo power plant, the solution features a generator that meets exacting inertial response requirements by adapting to constant load fluctuations, withstanding large disturbances, and then continuing to operate at optimal levels. Also, a special mechanical-drive radiator was designed to couple directly to the engine shaft, reducing the cost of installation and operation.

The C175-20 generator sets were manufactured in Lafayette, Indiana, and transported across land and sea for 30 days, including a final 600 miles (960 km) by cargo ship up the Amazon River to the inland port of Manaus. There, they were unloaded and hauled by truck another 460 miles (750 km) on a 36-hour journey through the rainforest and indigenous territories to Boa Vista.

"With Boa Vista so isolated from the rest of the country, we faced numerous challenges in building this plant," Mr. Orsine said. "About 95 percent of the equipment and supplies needed for this project came from outside the region, including everything from generator sets, transmission equipment and skilled labor to bricks, steel and more than 150,000 bags of cement."

Tanker trucks from Caracarái deliver the 200,000 to 250,000 liters of diesel fuel needed by the plant every day. To ensure the engines perform at optimal levels, the diesel fuel is stored on-

site, piped through a multi-stage filtering and centrifuge system, pumped to main tanks, and finally conveyed to 4,000-liter day tanks that supply each generator set.

Sotreq, the local Cat dealer, worked jointly with Oliveira Energia to meet the project's accelerated delivery schedule, providing extensive supervision of the project from the planning phase all the way through the commissioning of the system.

"It was important not only to deliver a power solution that meets the current power needs of the region, but also to design the plant in a modular way that allows for physical expansion and the installation of additional generator sets as demand rises in the years ahead," said Marcelo Souza, sales manager for Sotreq.

RESULTS

The power plant was completed on time and on budget, working to support growth and future prosperity by supplying power for schools, hospitals, water treatment plants, industrial facilities, homes and businesses.

At the present time, other local sources of power can meet the demand for a large portion of the day, but when the demand peaks in the afternoon and early evening, we are ready at a moment's notice to ensure the region has the power it needs," said Eduardo Figueiredo, the Monte Cristo plant manager for Oliveira Energia. "Our control room is in constant contact with the Eletrobras command center to monitor the power usage in real time and bring the generator sets online when needed."

Sotreq has embedded two technicians on-site to provide ongoing service and maintenance, assuring the continuous availability and operation of the power system. "Any time our lights flicker at home, we understand that we may have to initiate our generator sets to ensure power for the city," Figueiredo said.

To balance the environmental impact of the power plant, Oliveira Energia and Eletrobras Distribuição Roraima have committed to grow a million tree seedlings per year in a nursery located next to the new power plant. These will be donated to local schools, conservation groups and other volunteers to help preserve



The Monte Cristo power plant uses 34 Cat® C175-20 diesel generator sets to supply 3150 kW of gross power to the Boa Vista area.

the natural beauty of the region. Oliveira Energia is also leveraging another abundant resource by training students who attend nearby technical schools and hiring local talent. In fact, nearly all of the 80 employees at the plant are from Boa Vista and the surrounding region.

"We are keenly aware of the responsibility we have in bringing stability to the power system and the many benefits we bring to the population. The quality of life for residents is improving, businesses can be more productive and industry can flourish," Mr. Orsine said. "The success of this project is due to the joint efforts of the construction workers, engineers, project managers, service technicians, plant operators and many other people directly involved in the project, and with God's help we will continue to succeed."

For more information, please visit cat.com/powergeneration